Citation:

Houston DK, Driver KE, Bush AJ, Kritchevsky SB. The association between cheese consumption and cardiovascular risk factors among adults. *J Hum Nutr Diet.* 2008 Apr;21(2):129-40.

PubMed ID: 18339053

Study Design:

Cross-sectional Study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the association between the frequency of cheese consumption and several cardiovascular risk factors including measures of body fat, blood lipids, blood pressure, and blood glucose in US adults.

Inclusion Criteria:

- NHANES III participants
- Aged 25-75 years

Exclusion Criteria:

- Women pregnant at the time of the NHANES III examination
- Omission of five or more foods from the food frequency questionnaire (FFQ)
- Extremes in the reported consumption of total servings of food (upper 2.5%)
- Extremes in the consumption of cheese and cheese containing dishes (upper 2.5%)
- Anyone missing key variables

Description of Study Protocol:

Recruitment

Randomly using a stratified, multistage probability cluster design with over-sampling of Mexican-Americans, African-Americans and the elderly.

Design: Cross-sectional study, based on data from the NHANES III examination.

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

- Linear regression was used to compare anthropometrics, blood lipids, blood pressure and blood glucose across categories of cheese consumption (combined full and low-fat).

Data Collection Summary:

Timing of Measurements

Data from NHANES III, 1988-1994.

Dependent Variables

- Body mass index (BMI)--calculated using weight (kg) divided by square of height (m)
- Waist circumference--at high point of iliac crest
- Lipids--standard methodology
- Blood pressure--average of second and third measurement
- Fasting blood glucose--hexokinase enzymatic method

Independent Variables

- Cheese consumption (FFQ) asking one question about cheese per se and two questions asking about the consumption of foods containing large amount of cheese.

Control Variables

- Age
- Ethnicity
- Education
- Menopausal status for women
- Cigarette smoking
- Physical activity

Description of Actual Data Sample:

Initial N: 14,377

Attrition (final N): 10,872 participants with complete data

Age: aged 25-75

Ethnicity: 40% White, 30% African-American, 30% Mexican-American

Other relevant demographics:

Anthropometrics

Location: United States

Summary of Results:

Key Findings

- In women, more frequent cheese consumption was associated with higher HDL-cholesterol and lower LDL-cholesterol (P for trend <0.05).
- However, in men, more frequent cheese consumption was associated with a higher BMI, waist circumference, HDL-cholesterol and LDL-cholesterol, and diastolic blood pressure (P for trend < 0.05).
- Men consuming more than 30 servings per month had significantly higher BMI, waist circumference, and diastolic blood pressure compared to nonconsumers (P < 0.05).

Other Findings

- The overall mean number of cheese serving per month was 10.4, and the overall mean number of total cheese servings per month was 15.4.
- Cheese consumption was lower in older participants and was higher among Hispanics and Whites than among Blacks and persons of other ethnicity.
- Cheese consumption was higher among participants with more education but lower among those with more life-time cigarette use.
- The total servings of food over the previous month increased with increasing cheese consumption as did the number of servings of the foods high in saturated fat.
- Triglycerides, total cholesterol, and total:HDL cholesterol ratio were not significantly different across categories of cheese consumption in men or women.
- Systolic blood pressure was not significantly different across categories of cheese consumption in men or women.
- There were no significant differences in blood glucose by categories of cheese consumption in men or women.

Author Conclusion:

In conclusion, more frequent cheese consumption was associated with a less favorable body composition and cardiovascular risk profile in men, but in women, more frequent cheese consumption was associated with a more favorable cardiovascular risk profile. The type of cheese consumed by men and women may have differed resulting in opposing trends on body composition and cardiovascular risk factors. However, cheese consumption up to moderate frequency does not appear to be associated with a worse cardiovascular disease risk profile in men or women.

Reviewer Comments:

All cheeses combined in the analysis. Models were not adjusted for total energy and fat intake or fat subtypes.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes

2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes

	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes